FIG.1

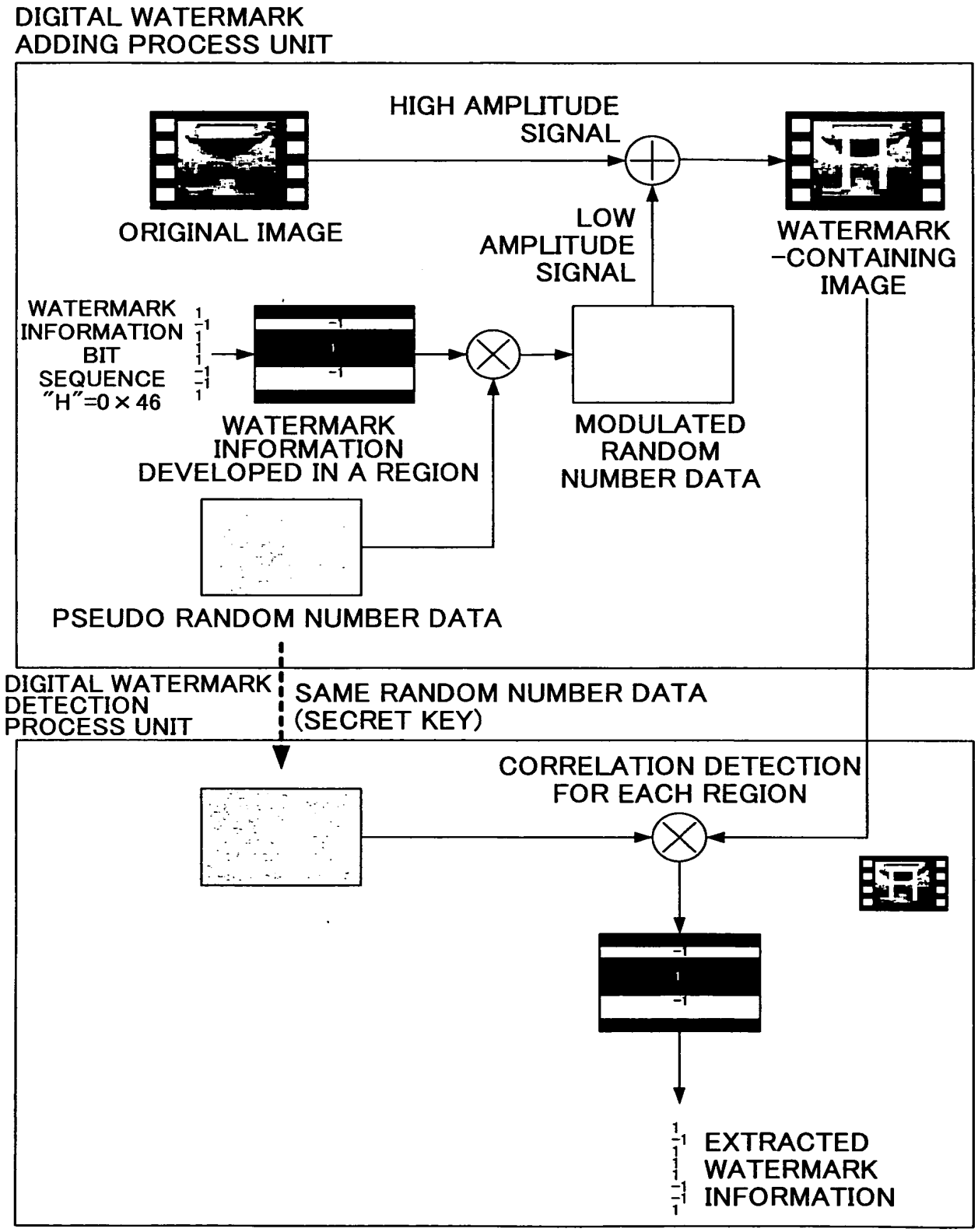
DIGITAL WATERMARK ADDING PROCESS UNIT
HIGH AMPLITUDE SIGNAL
ORIGINAL IMAGE
LOW AMPLITUDE SIGNAL
WATERMARK -CONTAINING IMAGE
WATERMARK INFORMATION BIT SEQUENCE "H"=0×46
WATERMARK INFORMATION DEVELOPED IN A REGION
MODULATED RANDOM NUMBER DATA
PSEUDO RANDOM NUMBER DATA
DIGITAL WATERMARK DETECTION PROCESS UNIT
SAME RANDOM NUMBER DATA (SECRET KEY)
CORRELATION DETECTION FOR EACH REGION
EXTRACTED WATERMARK INFORMATION

FIG.2

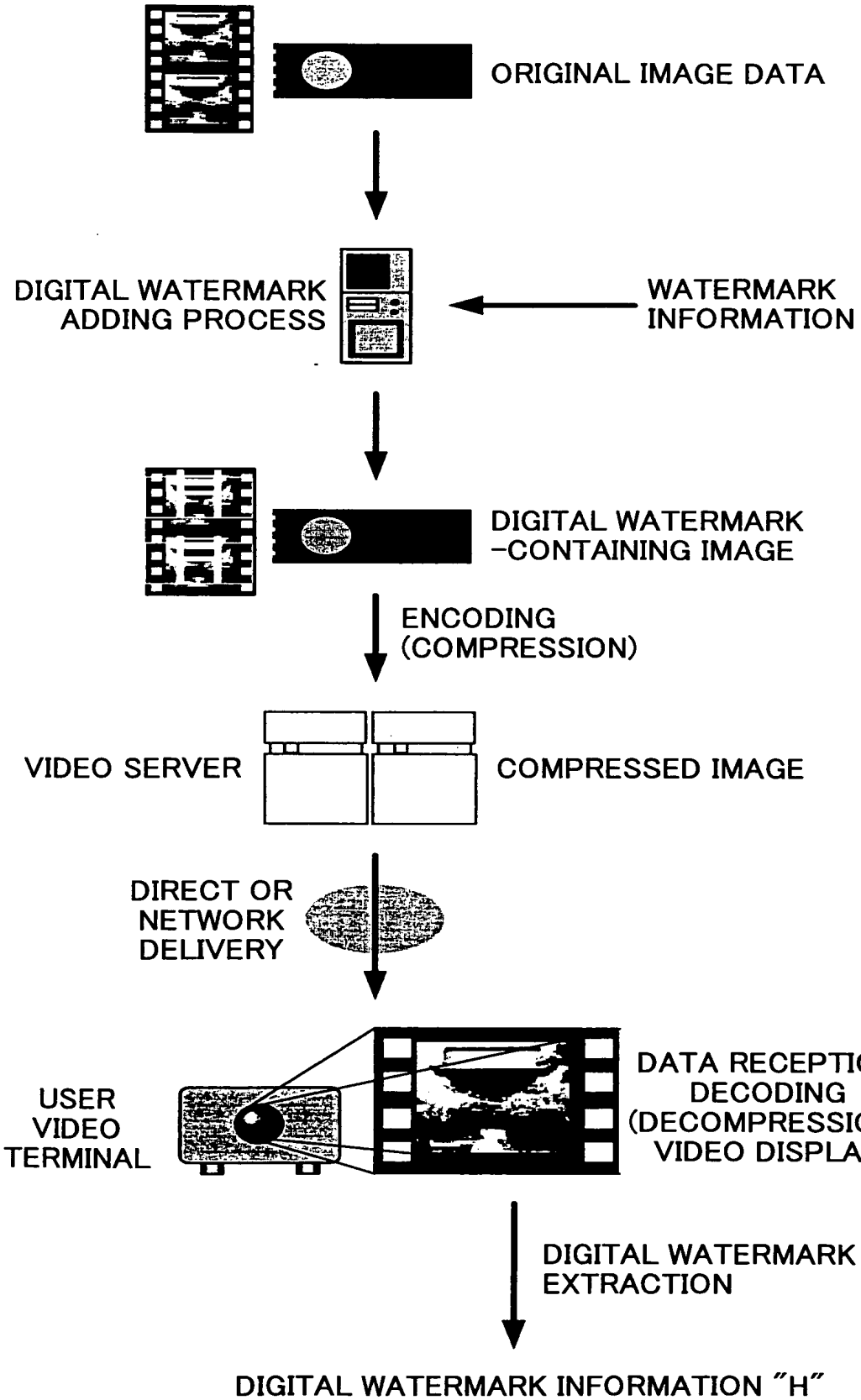
ORIGINAL IMAGE DATA
DIGITAL WATERMARK ADDING PROCESS
WATERMARK INFORMATION
DIGITAL WATERMARK -CONTAINING IMAGE
ENCODING (COMPRESSION)
VIDEO SERVER
COMPRESSED IMAGE
DIRECT OR NETWORK DELIVERY
USER VIDEO TERMINAL
DATA RECEPTION DECODING (DECOMPRESSION) VIDEO DISPLAY
DIGITAL WATERMARK EXTRACTION
DIGITAL WATERMARK INFORMATION "H"

FIG.3

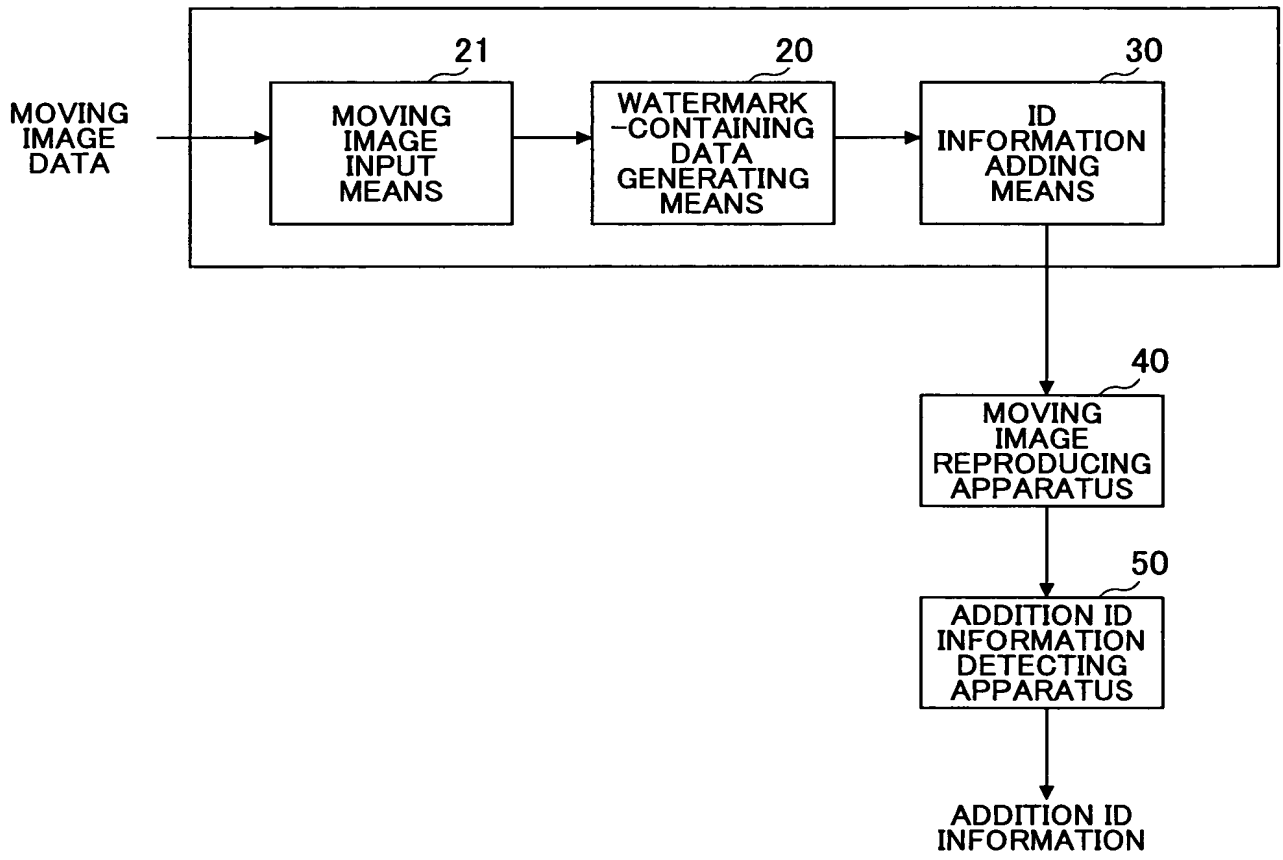
MOVING IMAGE DATA
21
MOVING IMAGE INPUT MEANS
20
WATERMARK -CONTAINING DATA GENERATING MEANS
30
ID INFORMATION ADDING MEANS
40
MOVING IMAGE REPRODUCING APPARATUS
50
ADDITION ID INFORMATION DETECTING APPARATUS
ADDITION ID INFORMATION

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FIG.4

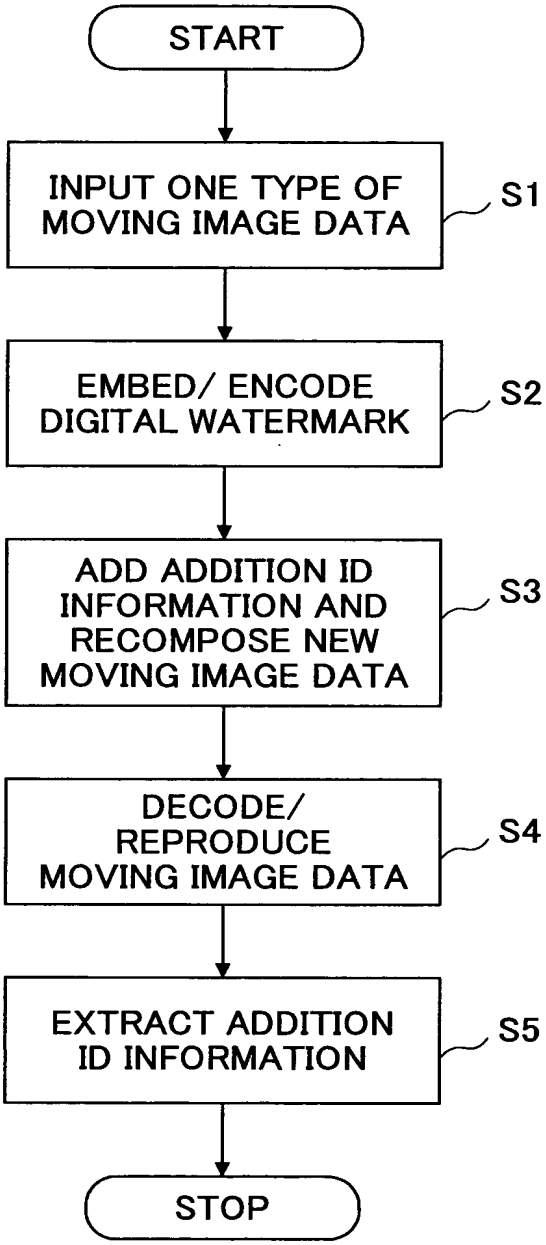

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FIG.5

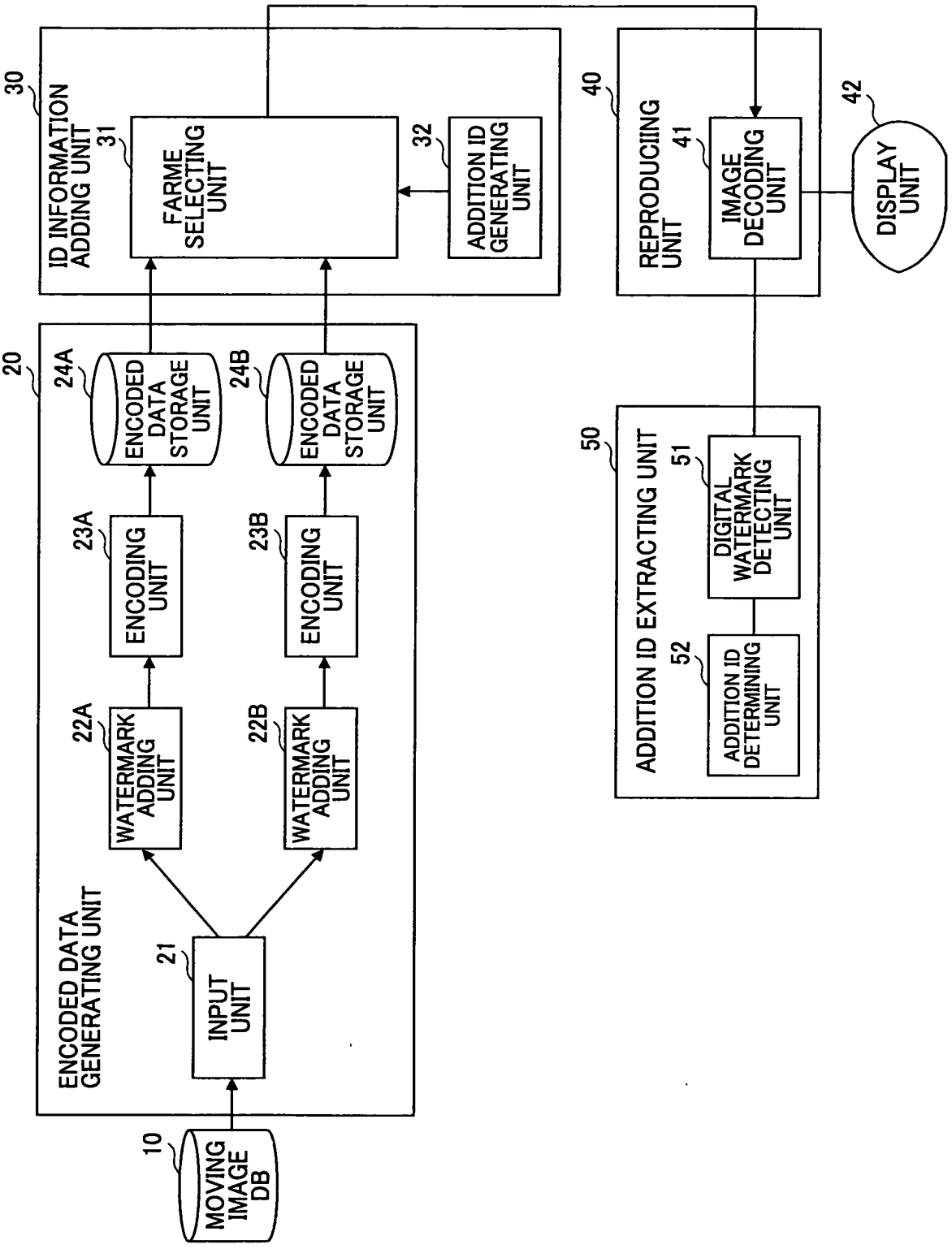

FIG.6

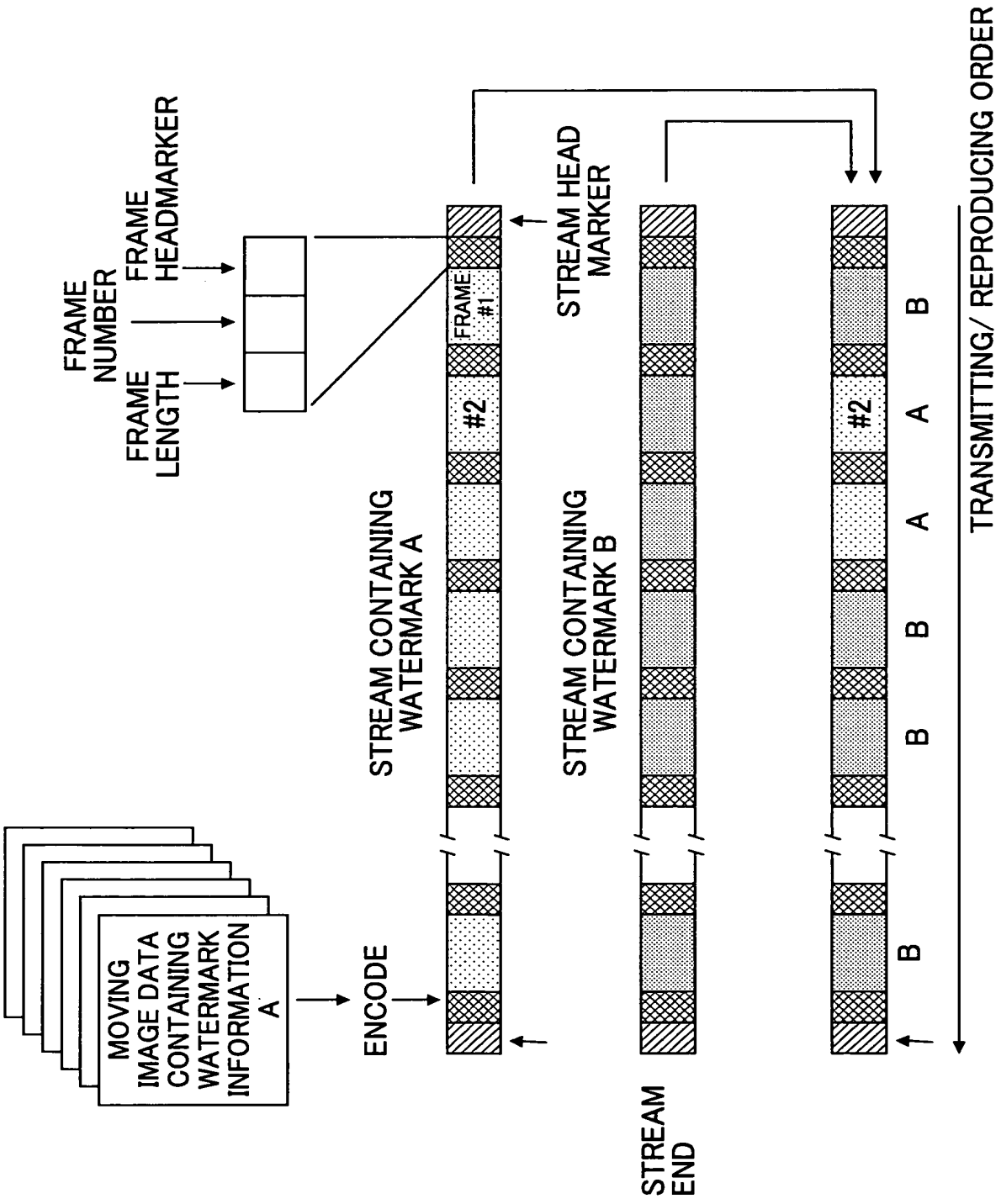
FRAME NUMBER
FRAME HEADMARKER
FRAME LENGTH
FRAME #1
#2
STREAM HEAD MARKER
STREAM CONTAINING WATERMARK A
STREAM CONTAINING WATERMARK B
MOVING IMAGE DATA CONTAINING WATERMARK INFORMATION A
ENCODE
STREAM END
B
B
B
A
A
B
TRANSMITTING/ REPRODUCING ORDER

FIG.7

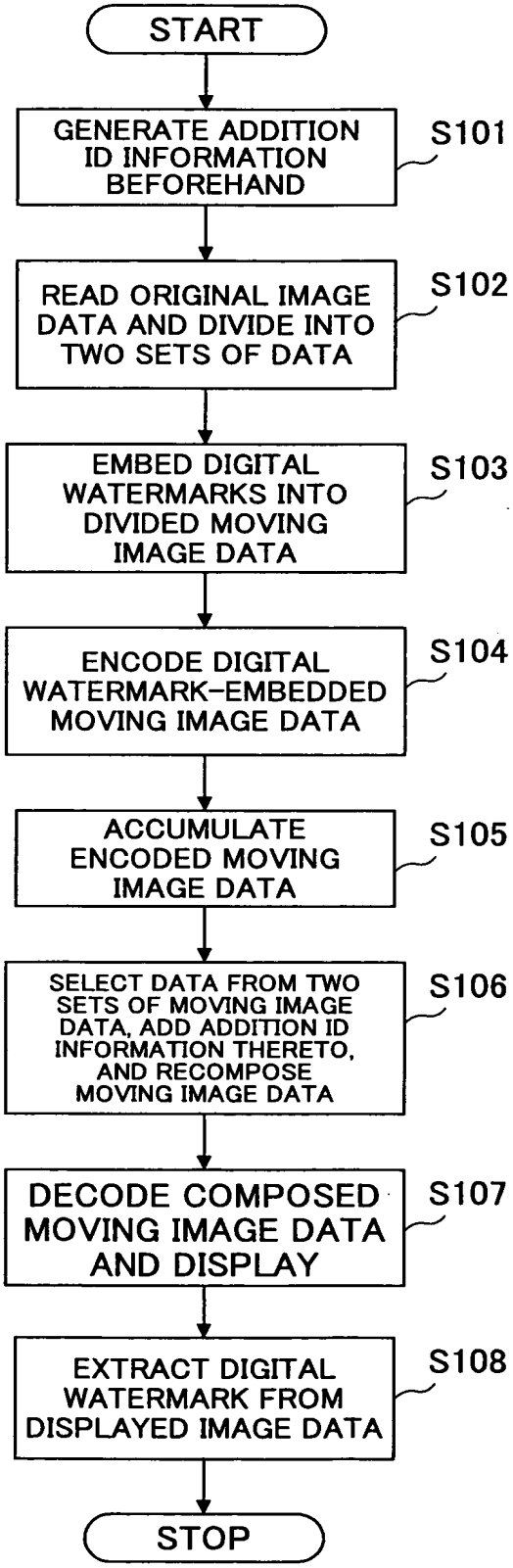
START
GENERATE ADDITION ID INFORMATION BEFOREHAND
S101
READ ORIGINAL IMAGE DATA AND DIVIDE INTO TWO SETS OF DATA
S102
EMBED DIGITAL WATERMARKS INTO DIVIDED MOVING IMAGE DATA
S103
ENCODE DIGITAL WATERMARK-EMBEDDED MOVING IMAGE DATA
S104
ACCUMULATE ENCODED MOVING IMAGE DATA
S105
SELECT DATA FROM TWO SETS OF MOVING IMAGE DATA, ADD ADDITION ID INFORMATION THERETO, AND RECOMPOSE MOVING IMAGE DATA
S106
DECODE COMPOSED MOVING IMAGE DATA AND DISPLAY
S107
EXTRACT DIGITAL WATERMARK FROM DISPLAYED IMAGE DATA
S108
STOP

FIG.8

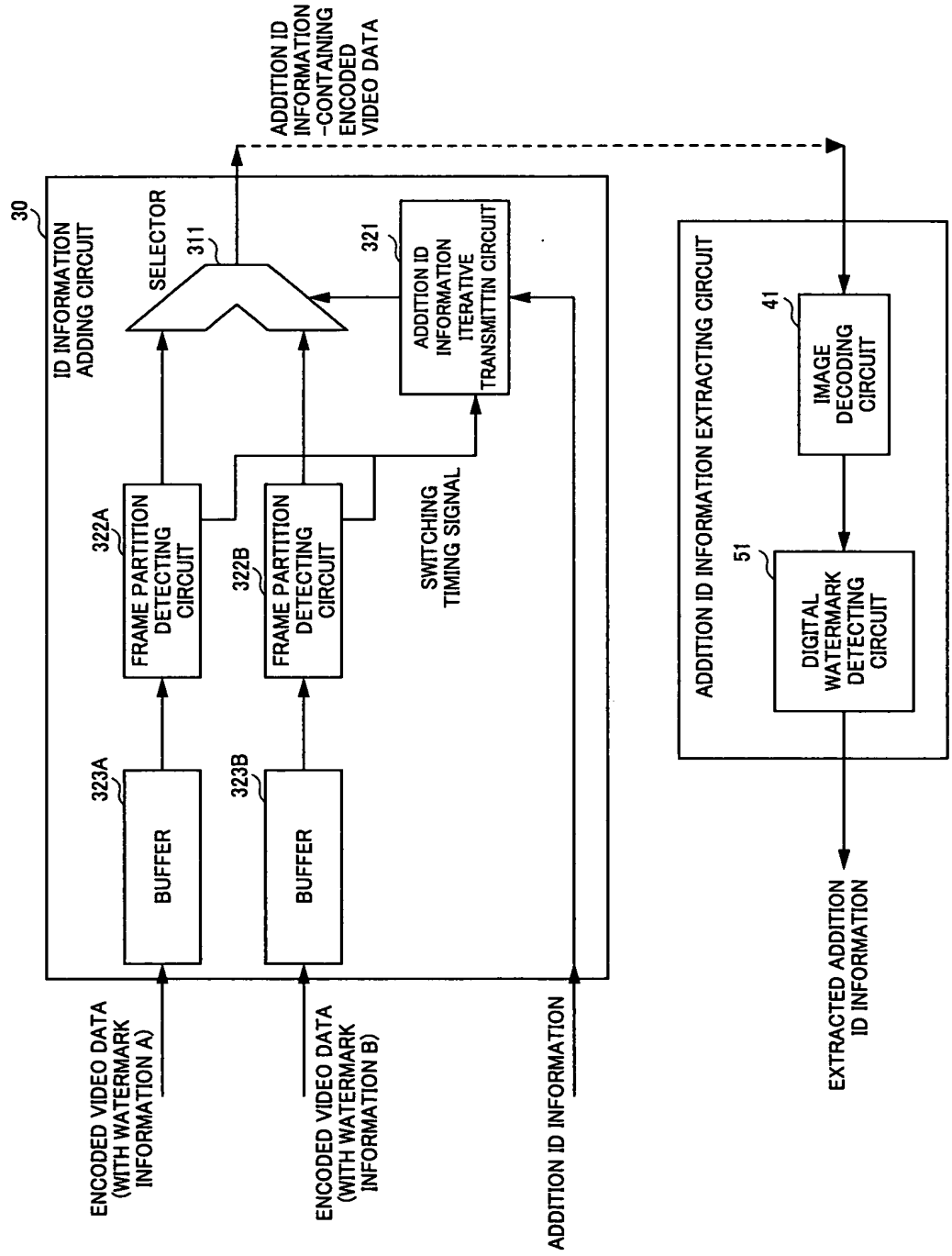
ADDITION ID INFORMATION -CONTAINING ENCODED VIDEO DATA
30
ID INFORMATION ADDING CIRCUIT
SELECTOR
311
321
ADDITION ID INFORMATION ITERATIVE TRANSMITTIN CIRCUIT
322A
FRAME PARTITION DETECTING CIRCUIT
322B
FRAME PARTITION DETECTING CIRCUIT
SWITCHING TIMING SIGNAL
323A
BUFFER
323B
BUFFER
ENCODED VIDEO DATA (WITH WATERMARK INFORMATION A)
ENCODED VIDEO DATA (WITH WATERMARK INFORMATION B)
ADDITION ID INFORMATION
ADDITION ID INFORMATION EXTRACTING CIRCUIT
41
IMAGE DECODING CIRCUIT
51
DIGITAL WATERMARK DETECTING CIRCUIT
EXTRACTED ADDITION ID INFORMATION

FIG.9

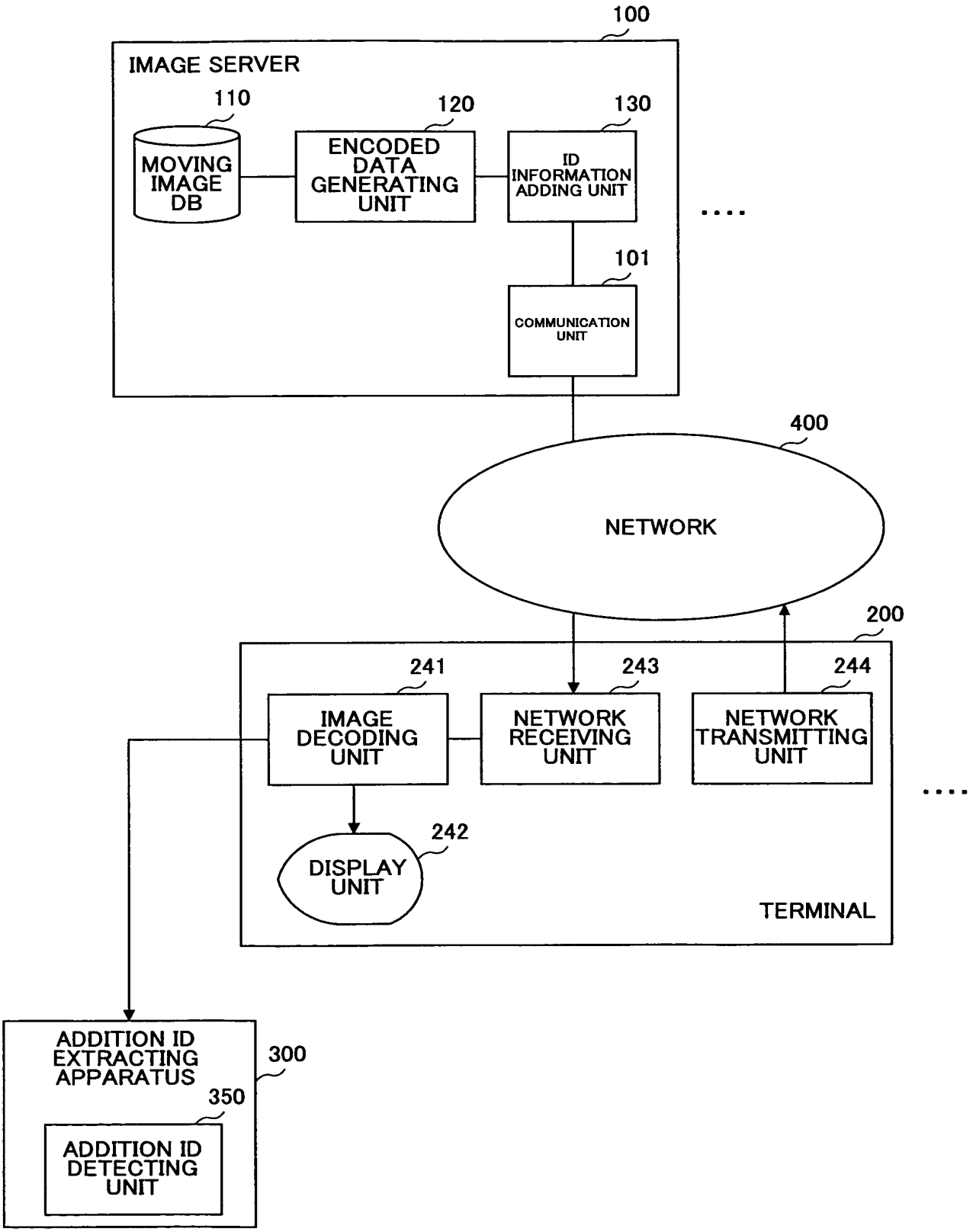
100
IMAGE SERVER
110
MOVING IMAGE DB
120
ENCODED DATA GENERATING UNIT
130
ID INFORMATION ADDING UNIT
101
COMMUNICATION UNIT
400
NETWORK
200
241
IMAGE DECODING UNIT
243
NETWORK RECEIVING UNIT
244
NETWORK TRANSMITTING UNIT
242
DISPLAY UNIT
TERMINAL
ADDITION ID EXTRACTING APPARATUS
300
350
ADDITION ID DETECTING UNIT

FIG.10

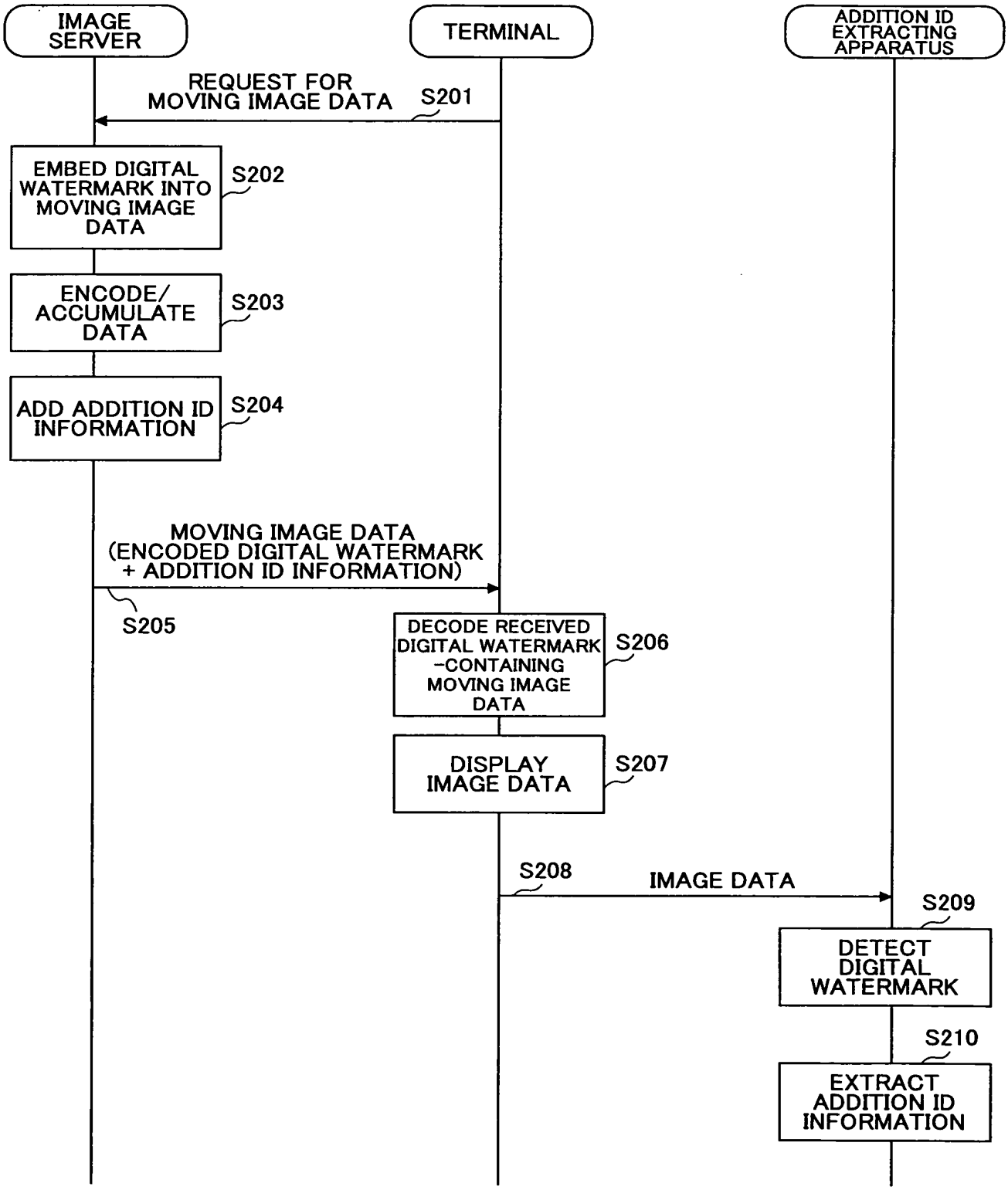
IMAGE SERVER
TERMINAL
ADDITION ID EXTRACTING APPARATUS
REQUEST FOR MOVING IMAGE DATA
S201
EMBED DIGITAL WATERMARK INTO MOVING IMAGE DATA
S202
ENCODE/ ACCUMULATE DATA
S203
ADD ADDITION ID INFORMATION
S204
MOVING IMAGE DATA (ENCODED DIGITAL WATERMARK + ADDITION ID INFORMATION)
S205
DECODE RECEIVED DIGITAL WATERMARK -CONTAINING MOVING IMAGE DATA
S206
DISPLAY IMAGE DATA
S207
S208
IMAGE DATA
S209
DETECT DIGITAL WATERMARK
S210
EXTRACT ADDITION ID INFORMATION

FIG.11

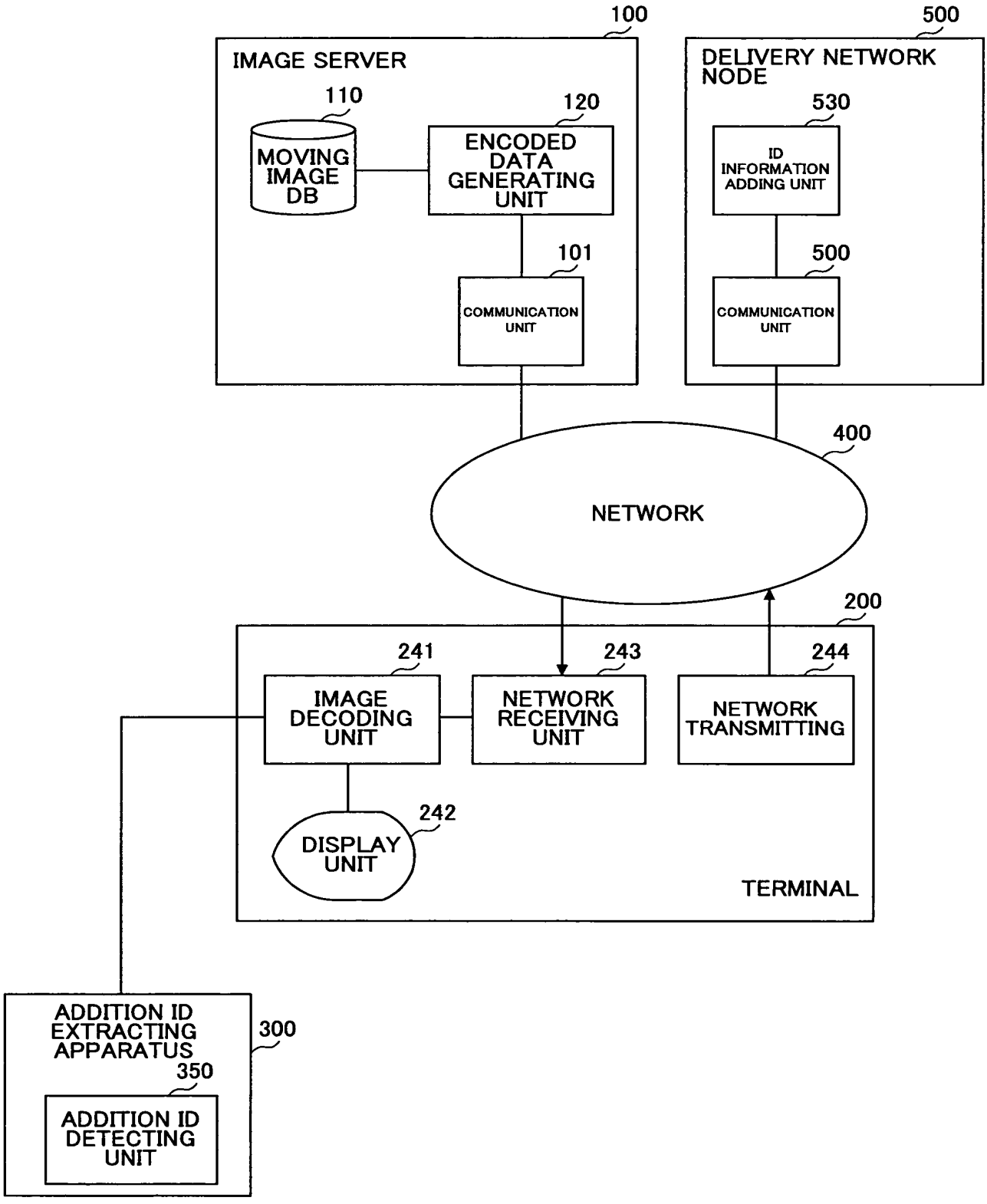
100
IMAGE SERVER
110
MOVING IMAGE DB
120
ENCODED DATA GENERATING UNIT
101
COMMUNICATION UNIT
500
DELIVERY NETWORK NODE
530
ID INFORMATION ADDING UNIT
500
COMMUNICATION UNIT
400
NETWORK
200
241
IMAGE DECODING UNIT
243
NETWORK RECEIVING UNIT
244
NETWORK TRANSMITTING
242
DISPLAY UNIT
TERMINAL
ADDITION ID EXTRACTING APPARATUS
300
350
ADDITION ID DETECTING UNIT

FIG.12

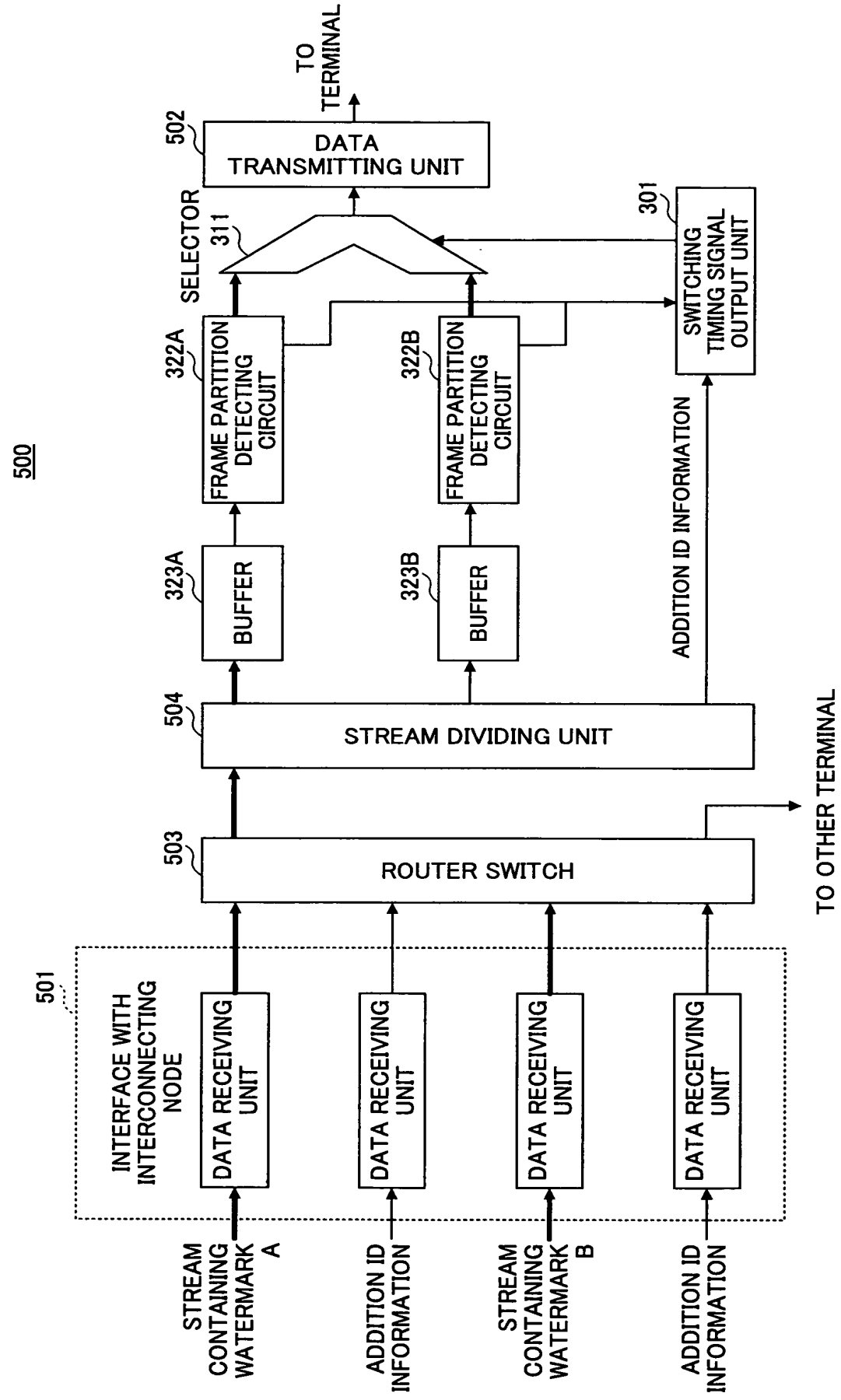
500
501
INTERFACE WITH INTERCONNECTING NODE
DATA RECEIVING UNIT
DATA RECEIVING UNIT
DATA RECEIVING UNIT
DATA RECEIVING UNIT
STREAM CONTAINING WATERMARK A
ADDITION ID INFORMATION
STREAM CONTAINING WATERMARK B
ADDITION ID INFORMATION
503
ROUTER SWITCH
TO OTHER TERMINAL
504
STREAM DIVIDING UNIT
323A
BUFFER
323B
BUFFER
322A
FRAME PARTITION DETECTING CIRCUIT
322B
FRAME PARTITION DETECTING CIRCUIT
ADDITION ID INFORMATION
301
SWITCHING TIMING SIGNAL OUTPUT UNIT
SELECTOR
311
502
DATA TRANSMITTING UNIT
TO TERMINAL

FIG.13

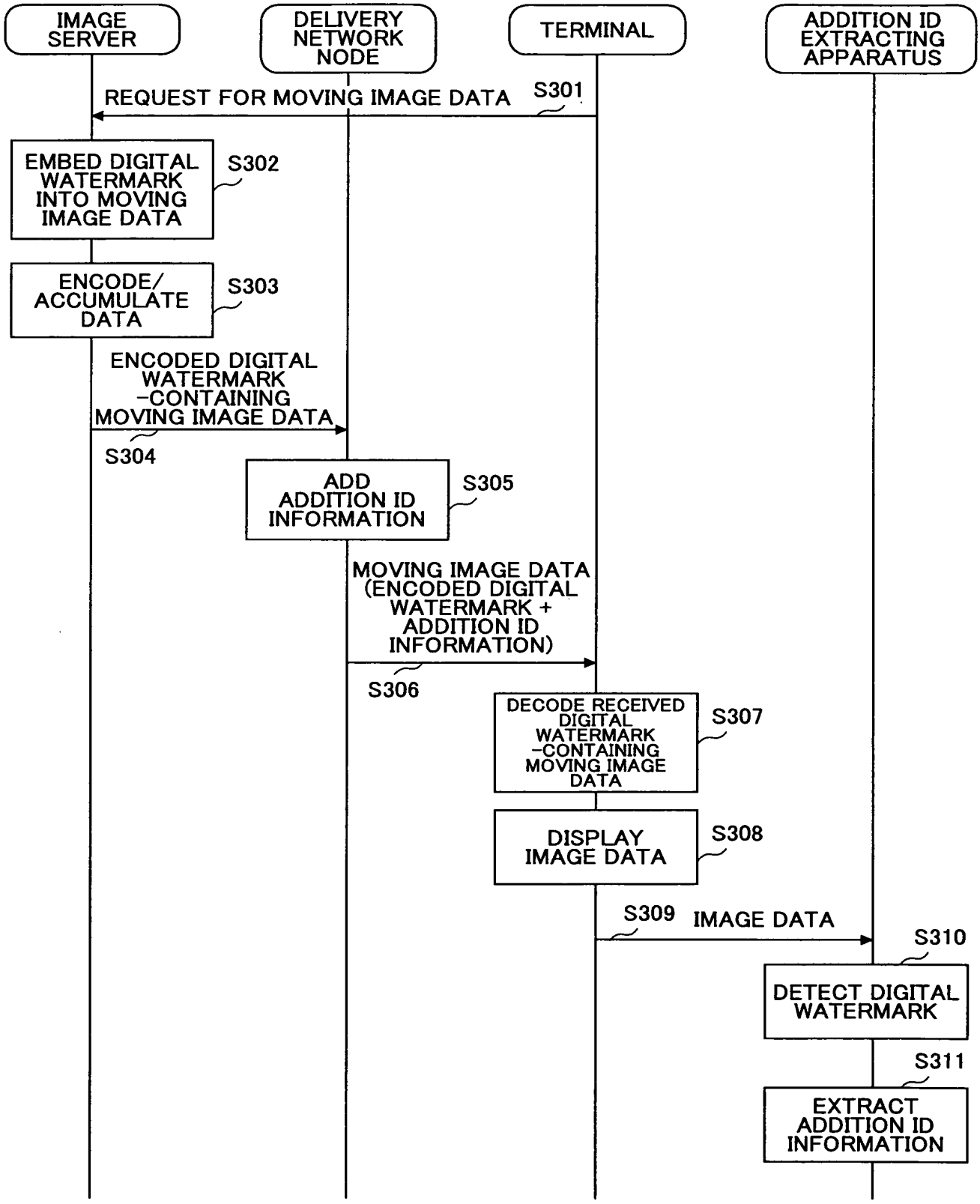
IMAGE SERVER
DELIVERY NETWORK NODE
TERMINAL
ADDITION ID EXTRACTING APPARATUS
REQUEST FOR MOVING IMAGE DATA
S301
EMBED DIGITAL WATERMARK INTO MOVING IMAGE DATA
S302
ENCODE/ ACCUMULATE DATA
S303
ENCODED DIGITAL WATERMARK -CONTAINING MOVING IMAGE DATA
S304
ADD ADDITION ID INFORMATION
S305
MOVING IMAGE DATA (ENCODED DIGITAL WATERMARK + ADDITION ID INFORMATION)
S306
DECODE RECEIVED DIGITAL WATERMARK -CONTAINING MOVING IMAGE DATA
S307
DISPLAY IMAGE DATA
S308
S309
IMAGE DATA
S310
DETECT DIGITAL WATERMARK
S311
EXTRACT ADDITION ID INFORMATION

FIG.14

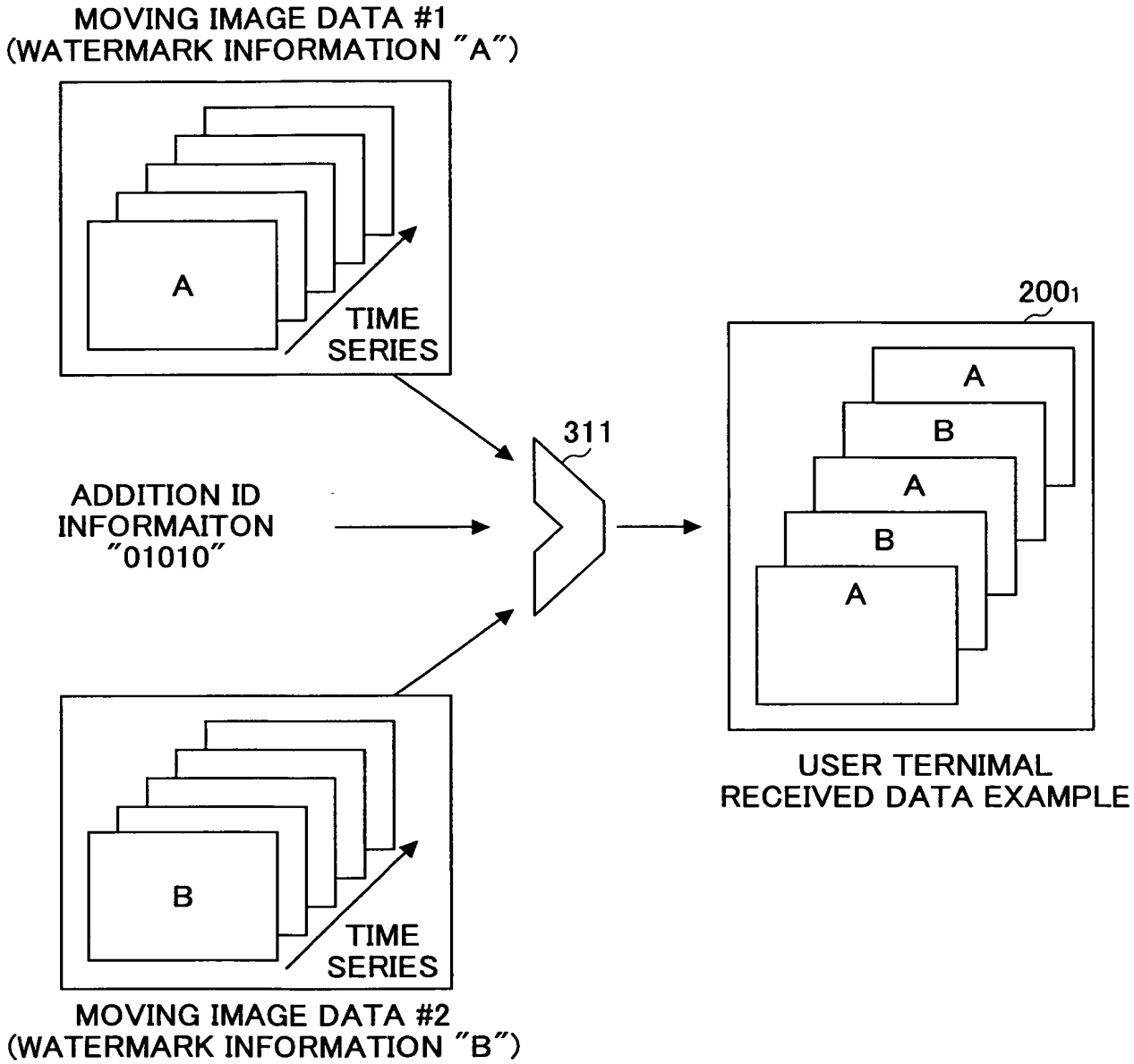
MOVING IMAGE DATA #1
(WATERMARK INFORMATION "A")
A
TIME SERIES
ADDITION ID INFORMAITON "01010"
311
2001
A
B
A
B
A
USER TERNIMAL RECEIVED DATA EXAMPLE
B
TIME SERIES
MOVING IMAGE DATA #2
(WATERMARK INFORMATION "B")

FIG.15

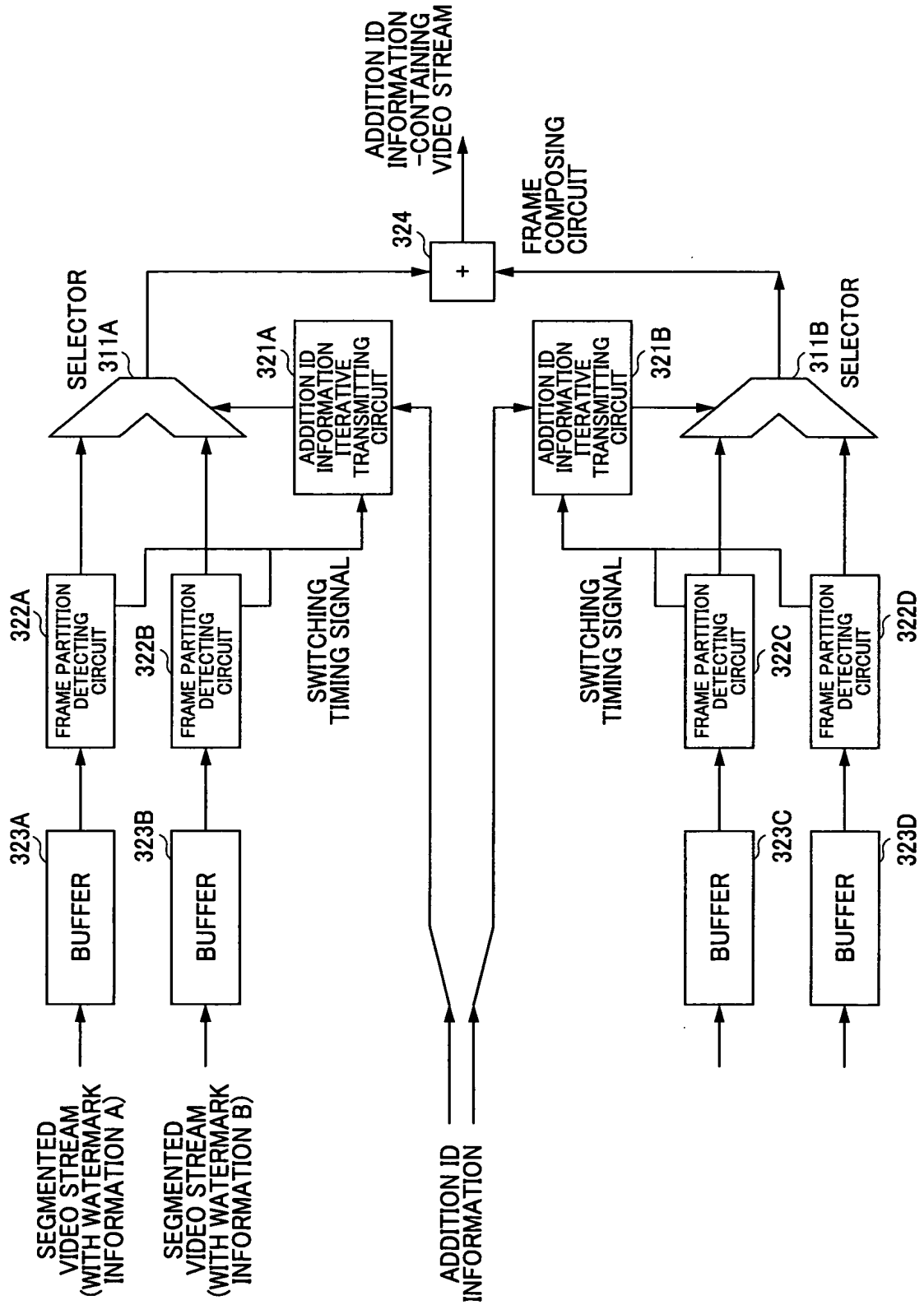
SEGMENTED VIDEO STREAM (WITH WATERMARK INFORMATION A)
SEGMENTED VIDEO STREAM (WITH WATERMARK INFORMATION B)
ADDITION ID INFORMATION
323A
323B
323C
323D
BUFFER
322A
322B
322C
322D
FRAME PARTITION DETECTING CIRCUIT
SWITCHING TIMING SIGNAL
321A
321B
ADDITION ID INFORMATION ITERATIVE TRANSMITTING CIRCUIT
311A
311B
SELECTOR
324
+
FRAME COMPOSING CIRCUIT
ADDITION ID INFORMATION -CONTAINING VIDEO STREAM

FIG.16

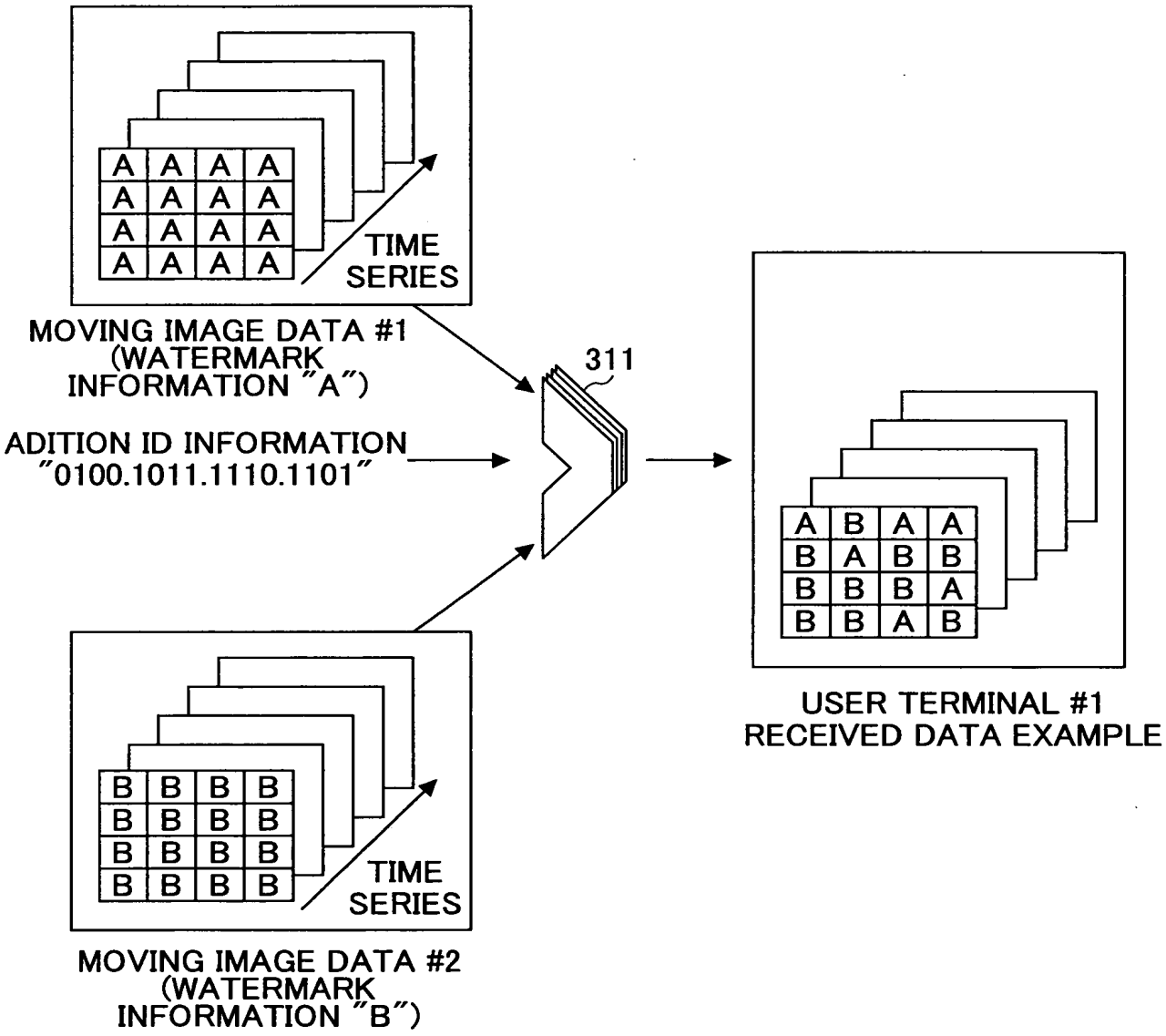
A A A A
A A A A
A A A A
A A A A
TIME SERIES
MOVING IMAGE DATA #1 (WATERMARK INFORMATION "A")
ADITION ID INFORMATION "0100.1011.1110.1101"
311
A B A A
B A B B
B B B A
B B A B
USER TERMINAL #1 RECEIVED DATA EXAMPLE
B B B B
B B B B
B B B B
B B B B
TIME SERIES
MOVING IMAGE DATA #2 (WATERMARK INFORMATION "B")

FIG.17

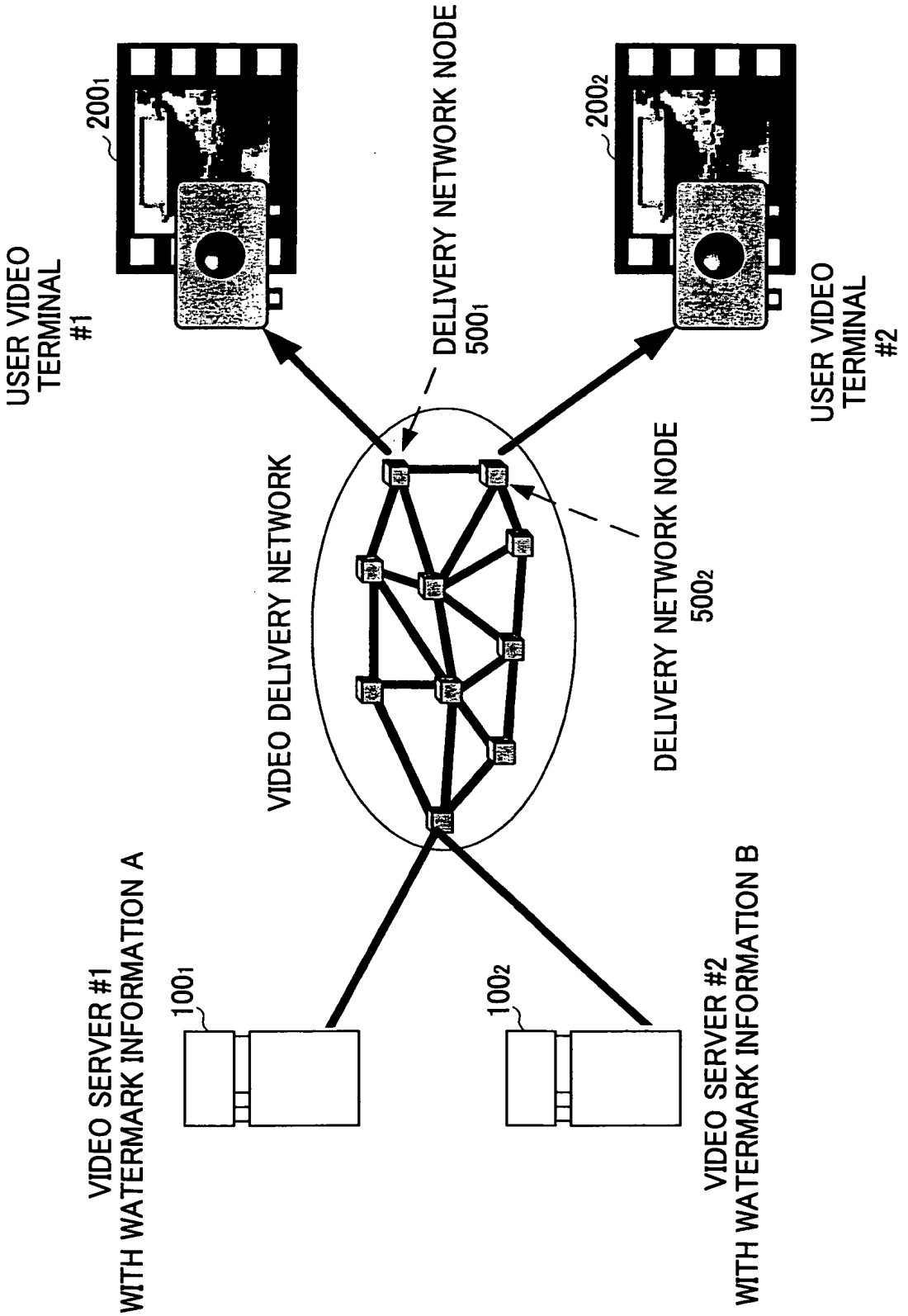
USER VIDEO TERMINAL #1
$200_1$
DELIVERY NETWORK NODE $500_1$
$200_2$
USER VIDEO TERMINAL #2
VIDEO DELIVERY NETWORK
DELIVERY NETWORK NODE $500_2$
VIDEO SERVER #1 WITH WATERMARK INFORMATION A
$100_1$
$100_2$
VIDEO SERVER #2 WITH WATERMARK INFORMATION B

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FIG.18

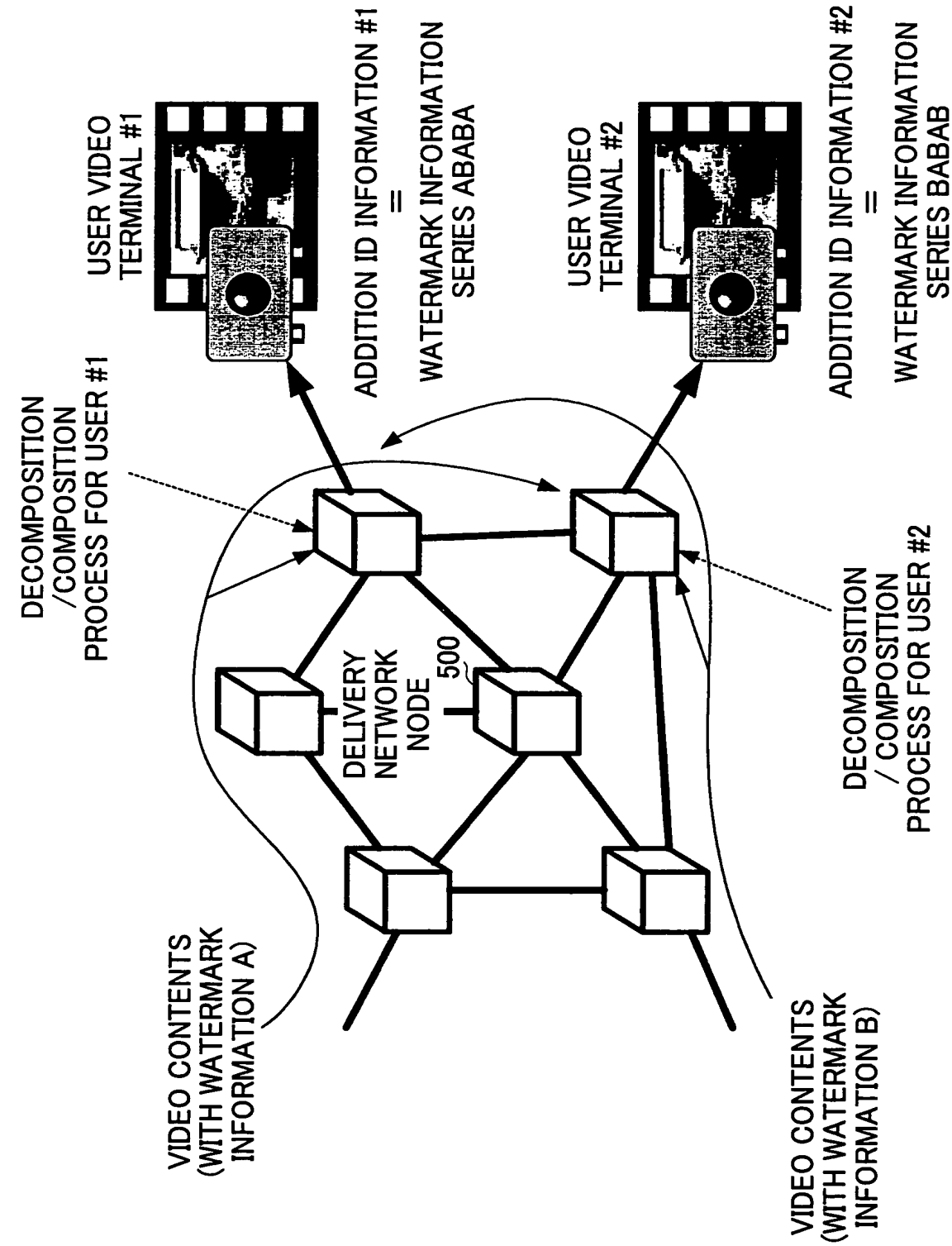

FIG.19

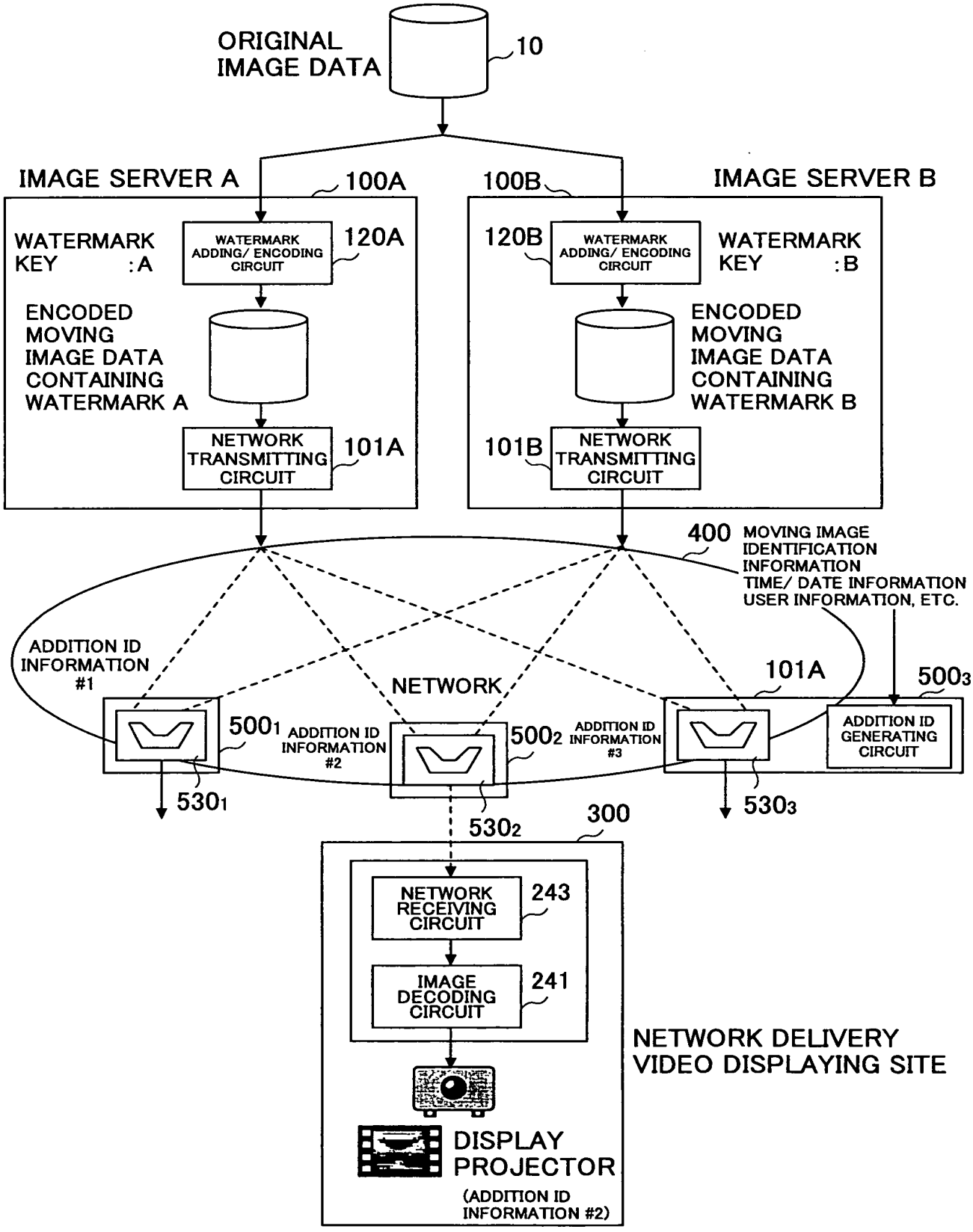
ORIGINAL IMAGE DATA
10
IMAGE SERVER A
100A
100B
IMAGE SERVER B
WATERMARK KEY :A
WATERMARK ADDING/ ENCODING CIRCUIT
120A
120B
WATERMARK KEY :B
ENCODED MOVING IMAGE DATA CONTAINING WATERMARK A
ENCODED MOVING IMAGE DATA CONTAINING WATERMARK B
NETWORK TRANSMITTING CIRCUIT
101A
101B
400
MOVING IMAGE IDENTIFICATION INFORMATION
TIME/ DATE INFORMATION
USER INFORMATION, ETC.
ADDITION ID INFORMATION #1
NETWORK
5001
ADDITION ID INFORMATION #2
5002
ADDITION ID INFORMATION #3
5003
ADDITION ID GENERATING CIRCUIT
5301
5302
5303
300
NETWORK RECEIVING CIRCUIT
243
IMAGE DECODING CIRCUIT
241
DISPLAY PROJECTOR
(ADDITION ID INFORMATION #2)
NETWORK DELIVERY VIDEO DISPLAYING SITE

FIG.20

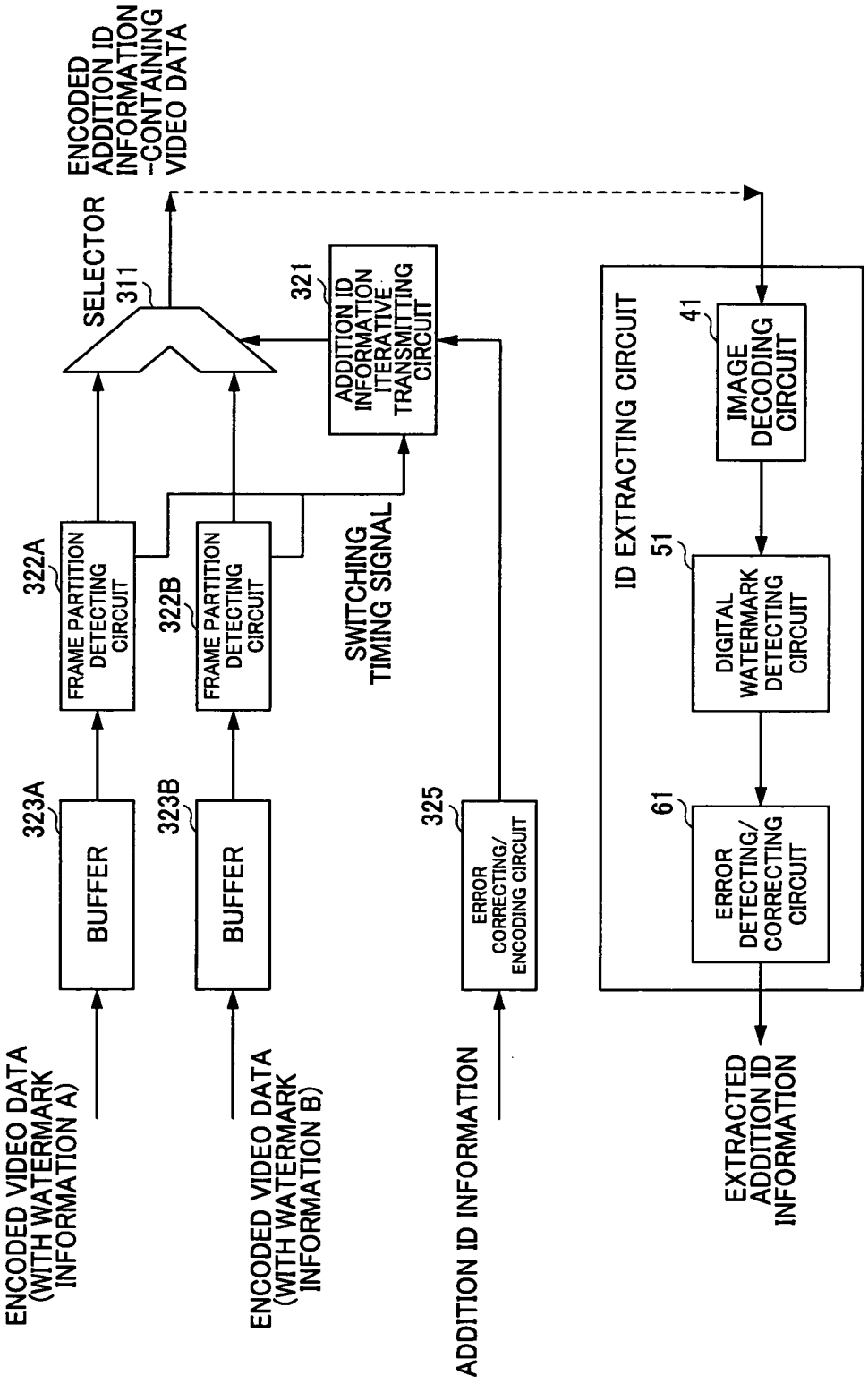
ENCODED ADDITION ID INFORMATION -CONTAINING VIDEO DATA
SELECTOR
311
321
ADDITION ID INFORMATION ITERATIVE TRANSMITTING CIRCUIT
322A
FRAME PARTITION DETECTING CIRCUIT
322B
FRAME PARTITION DETECTING CIRCUIT
SWITCHING TIMING SIGNAL
323A
BUFFER
323B
BUFFER
325
ERROR CORRECTING/ ENCODING CIRCUIT
ENCODED VIDEO DATA (WITH WATERMARK INFORMATION A)
ENCODED VIDEO DATA (WITH WATERMARK INFORMATION B)
ADDITION ID INFORMATION
ID EXTRACTING CIRCUIT
41
IMAGE DECODING CIRCUIT
51
DIGITAL WATERMARK DETECTING CIRCUIT
61
ERROR DETECTING/ CORRECTING CIRCUIT
EXTRACTED ADDITION ID INFORMATION

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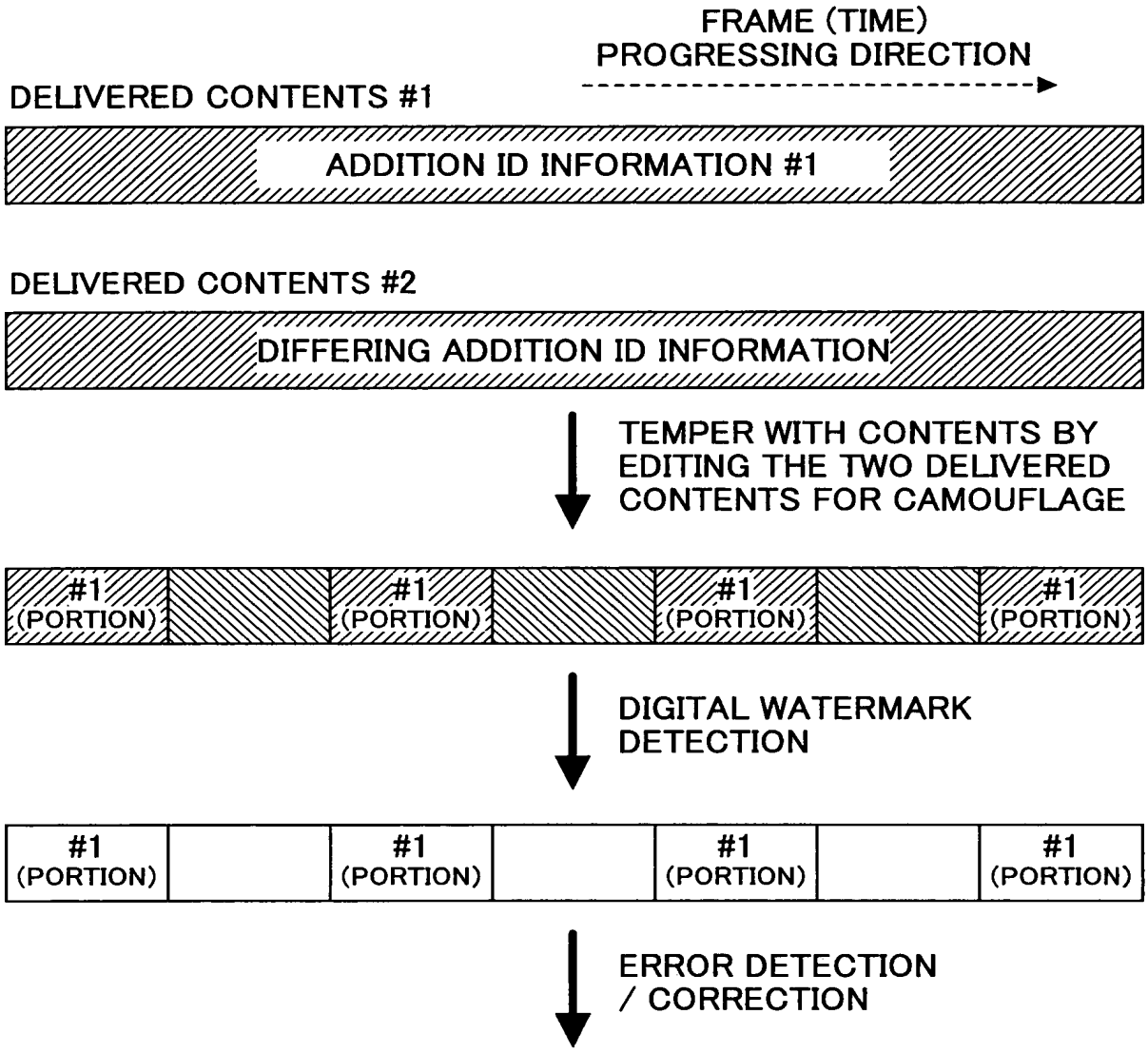
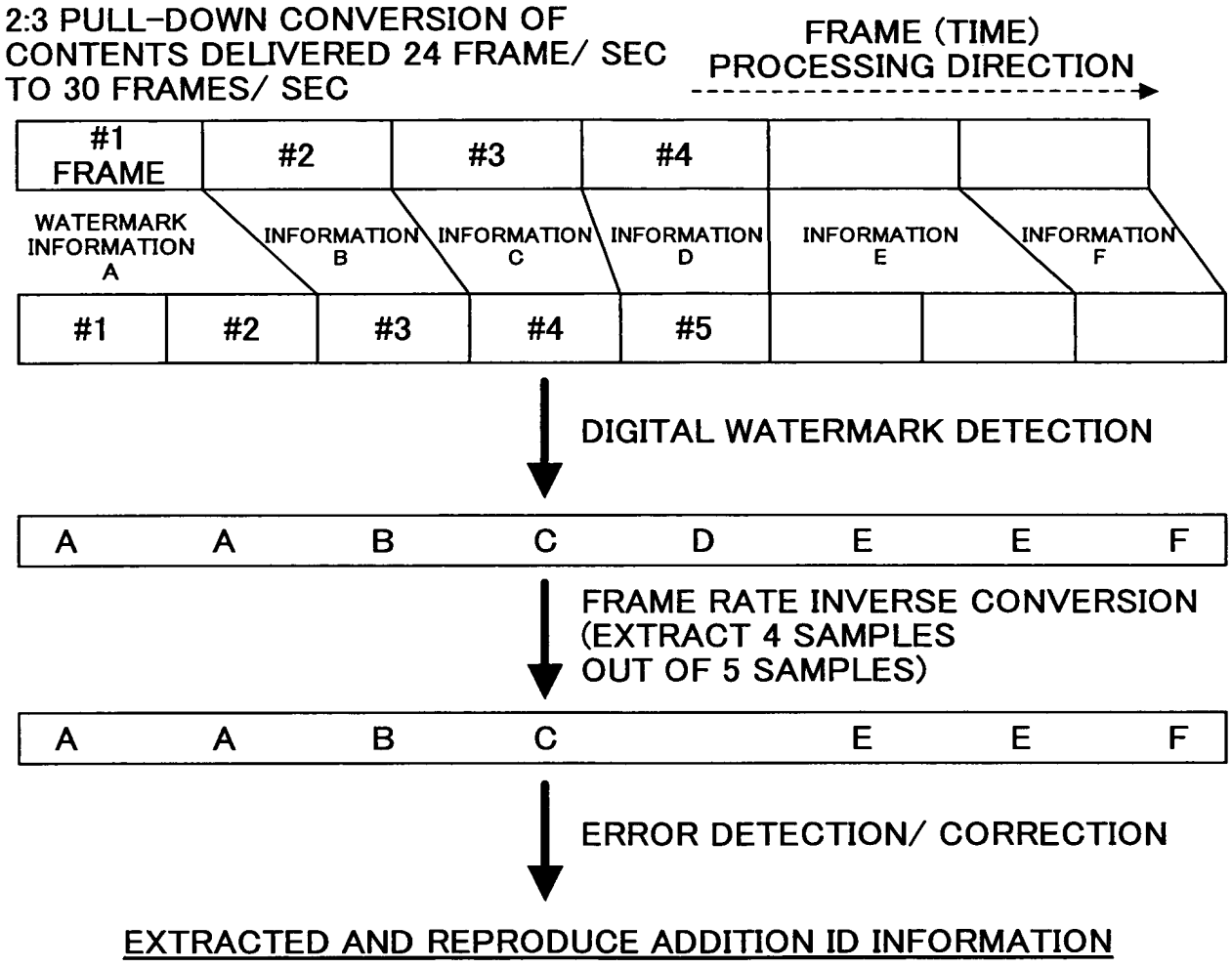
FIG.21




EXTRACTED AND REPRODUCED ADDITION ID INFORMATION

# FIG.22


2:3 PULL-DOWN CONVERSION OF CONTENTS DELIVERED 24 FRAME/ SEC TO 30 FRAMES/ SEC
FRAME (TIME) PROCESSING DIRECTION
#1 FRAME
#2
#3
#4
WATERMARK INFORMATION A
INFORMATION B
INFORMATION C
INFORMATION D
INFORMATION E
INFORMATION F
#1
#2
#3
#4
#5
DIGITAL WATERMARK DETECTION
A A B C D E E F
FRAME RATE INVERSE CONVERSION (EXTRACT 4 SAMPLES OUT OF 5 SAMPLES)
A A B C E E F
ERROR DETECTION/ CORRECTION
EXTRACTED AND REPRODUCE ADDITION ID INFORMATION